NASA-CR-201799

NAGW-3099

Instrumentation for Achieving High Angular Resolution on the NASA Infrared Telescope

Progress Report February 1996

Donald N. B. Hall - Principal Investigator
R. L. Baron - Project Manager

Instrumentation developed under this project has been successfully tested on the IRTF within the software, electronic, mechanical, thermal, and optical environments. This hardware is expected to be placed into full service during the second semester 1996 on a shared risk basis. The status of the various portions of the project is described in detail below.

This project has undergone a number of delays leading to the current projected shared risk implementation beginning with an extended shakedown in August 1996, the beginning of the second semester of observing at the IRTF. A review of the various delays as to there cause and impact on the project are detailed in an appendix to this report. Here we report on current activity and expectations.

Mechanical

1- The Hexapod and tip-tilt assembly were received and they have been extensively tested. The design was found to need some relatively minor but time consuming modifications, (eg. a lubricant qualified for lower temperature, a partially redesigned thermal compensating joint, and some additional software modifications) all to be done by the manufacturer at no cost to the IRTF. Final testing is scheduled for an August 1996 engineering run.

Optical

1- A fully figured and polished Silicon Carbide mirror has been delivered and tested successfully at the telescope. This constitutes the delivery of a "ground blank" however since the surface shows numerous pits, hence does not meet the specifications as agreed to by the vendor. The delivery of a mirror fully meeting the rigid specifications required by contract is expected during the month of July 1996. This final mirror is expected to have a significantly better scratch and dig quality.

Electronics

1- As mentioned above, the electronics have been successfully tested over the last year and are undergoing a modification to allow a fiber_optic link from the telescope to the warm room, where the bulk of the electronics will be housed. This is the first IRTF instrument to undergo this modification but it is expected to be the norm in the future and existing instruments are expected to be retrofitted. A significant reduction in heat generated at the focal plane of the telescope should result with improved average image quality.

Software

1- Software to operate this instrument has been completed. Work is progressing within the IRTF to complete the IRTF interfaces and allow the instrument software modifications to be implemented, an ongoing task.

Project Schedule
Major milestones

April 26, 1996

Receipt of modified tip-tilt/hexapod assembly from vendor.

July 15, 1996

Receipt of final Silicon Carbide Secondary mirror. An interim mirror sufficiently good for all initial testing has already been received.

August 1996

Expected permanent installation on the IRTF with final testing of instrument specific hardware and software.

APPENDIX 1
Circumstances surrounding extended completion of the proposed work.

March 1, 1992	Proposal approved
June 17, 1992	Date of award
February 4, 1994	Project software engineer **resigned**.

June 6, 1994	Replacement Software engineer **started**- substantial software system redesign adopted.
June 28, 1994	Project Electronics engineer **resigned**.
June 17, 1994	Replacement Electronics engineer **started**- Almost total electronic redesign adopted which permitted a system much closer in design to that in other IRTF instruments.
July 1995	**Delivery** of **Silicon Carbide** polished **mirror delayed - Catastrophic failure of polishing machine** at the Vavilov manufacturing facility. The **mirror**, in final figuring, was **destroyed** as a result.
November 28, 1995	System test at the telescope resulted in the identification of the following: 1- The cold temperature specification was not met with the delivered hexapod secondary mirror support, actuators froze, and 2- The mirror support introduced excessive forces warping the test mirror at operating conditions (temperature).
January 1996	Tip-tilt system **returned to manufacturer for modifications**,
April 1996	**Tip-tilt system** (as modified) **delivered** to the University
May 10, 1996	Secondary **mirror support plate returned to factory** (part of tip-tilt system) for further modifications since welding technique used in modifications produced a weld that is apparently too brittle resulting in need to rework (welds completely separated in shipping).
June 1, 1996	Expected **delivery** of modified secondary **mirror support plate**.